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ABSTRACT

The purpose of the Idaho Direct Mathematics Assessment (DMA) is to measure Idaho students' mathematical problem-solving skills, including their ability to apply basic skills to problem-solving situations as stated in the Idaho Achievement Standards document. Problem solving is valued as an essential tool for success in a complex, modern world. The DMA provides valuable information about students' basic skill levels and their ability to effectively apply and communicate mathematical processes and strategies, creative thinking, and decision-making. The data collected as a result of this assessment assists in the development of curriculum and instructional strategies and improves student achievement. This document contains the DMA eighth grade assessment toolkit for educators to use in their classrooms. Essential knowledge, processes, and skills for eighth grade students are listed. Scoring information is also provided. (ASK)

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8TH GRADE

DIRECT MATHEMATICS ASSESSMENT

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TOOLKIT

REVISED 2000

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DR. MARILYN HOWARD
SUPERINTENDENT OF PUBLIC INSTRUCTION
FOR THE STATE OF IDAHO

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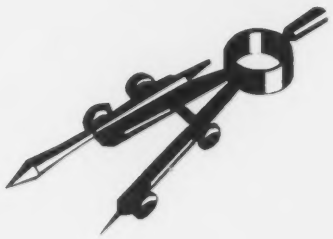
8TH GRADE

DIRECT MATHEMATICS ASSESSMENT



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Idaho Direct Mathematics Assessment

Toolkit

Developed by the Idaho Direct Mathematics Assessment Steering Committee

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Direct Mathematics Assessment
8th Grade Toolkit

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Section I

General Information

- ✓ Purpose
- ✓ Introduction
- ✓ Direct Assessment Terms
- ✓ Calculator Usage
- ✓ Types of Prompts

PURPOSE STATEMENT

The purpose of the *Idaho Direct Mathematics Assessment (DMA)* is to measure Idaho students' mathematical problem-solving skills, including their ability to apply skills learned in alignment with the Idaho Math Achievement Standards to problem-solving situations. Problem solving is valued as an essential tool for success in a complex, modern world. The DMA will provide valuable information about students' basic skill levels and their ability to effectively apply and communicate about mathematical processes and strategies, creative thinking, and decision making. The data collected as a result of this assessment will assist in the development of curriculum and instructional strategies for teachers, and will improve student achievement.

Introduction

Assessment is one of the guidance systems of education. Assessment, to be fully utilized, must advance education by:

- measuring what students know--record the status of education
- expressing what students should know--support curriculum goals
- enhancing learning
- providing insight for how curriculum should be taught--support good instructional
- practices

The use of standardized tests such as the Iowa Test of Basic Skills (ITBS) allows us to measure math skills. The Direct Mathematics Assessment (DMA) has been developed to support Idaho's instruction and curriculum goals in mathematics. Standardized tests and the DMA are complementary assessments that meet different needs:

Standardized Tests

- reflect national standards
- measure skills
- rank students according to national norms
- provide a measure of student growth in math skills over the years

Direct Mathematics Assessments

- reflect goals and curriculum objectives as established by the State of Idaho
- assist in building conceptual bridges between skills and processes
- measure a student's demonstrated
  - ability to solve problems and select appropriate processes
  - level of thinking and cognitive development
  - communication of mathematical processes and strategies
  - accuracy
- encourage creative thinking, decision-making, and mathematical application and connections
- provide a mechanism to improve instruction by analyzing student results

In the final analysis, this Idaho Direct Mathematics Assessment is a means to improve instruction and student achievement.

Process of DMA development

- emphasizes cognitive development, synthesization of knowledge of basic skills, accuracy, and ability to apply information through problem solving
- assesses concepts and skills selected from a provided list

Expected technology

- 4th grade--no calculators
- 8th grade--calculator availability expected

Process of DMA scoring

- assesses problem solving skills--did the student:
  - understand problem
  - select an appropriate strategy
  - show willingness to consider different strategies
  - use a systematic process
  - show perseverance
  - check work/justify answer
  - accurately solve the problem
- evaluates student performance holistically using a scoring standard
- emphasizes process and justification of answers
- accepts multiple appropriate processes and solutions

Direct Assessment Terms and Definitions

THE ASSESSMENT

Direct or performance assessments enable students to demonstrate knowledge by using it effectively to create a product, solve a problem, or complete a task. A direct assessment differs from a conventional test in the same way a written test of driving rules differs from an on-the-road driving test, which replicates typical daily driving.

A ***prompt*** is a directive to a student to undertake a performance or task. A prompt typically includes a short vignette and questions or tasks related to the information in the vignette.

SKILLS

Open-ended thinking involves responding to a problem with either many possible correct answers, or one in which the best answers can be obtained in many ways. Open-ended responses are not simply a matter of taste, but are based on the logical soundness of a viewpoint, as well as whether they meet selected standards.

Descriptors are sets of indicators to help determine a student□s level of achievement in a direct assessment. Descriptors direct scorers where to look within an assessment in order to make the best judgment or evaluation. Descriptors empirically describe traits of work, which scorers do and do not value. (i.e., processes, strategies)

Process refers to steps a student takes to reach an answer, and may include strategies, decisions, reasoning, and communication. Assessing processes requires scorers to explicitly judge beyond what can be inferred from the end product. Scorers must, however, keep in mind the importance of determining whether a final product or performance meets required standards.

Traits are more specific details to help judge a performance or assessment. (i.e., computation, labels)

SCORING

Scoring standards or rubrics provide guidelines to assist in determining scores. Scoring standards list descriptors, describe traits assessed, and help scorers assign the product to a scale using terms that summarize indicators of work.

Anchor papers or main range finders provide a mid-range sample (not high, not low) of each level of performance on the scoring scale.

Holistic scoring is based on an overall impression of an assessment. Scorers attempt to match an overall impression to point scale descriptors to determine a final score.

Point scales enable comparisons, but also summarize the most telling and important hallmarks within a range. Unlike conventional tests that rate students on a 100-point scale (usually percent correct), performance assessments typically use a four-, five-, or six-point scale.

Calculator Usage

The appropriate use of technology is encouraged in the classroom. 581.03.a

Eighth Grade: Calculators will be expected to be available for students to use on the DMA.

The eighth grade assessment is designed with real-life problems and this can be more effectively assessed when students do have access to calculators. Districts should ensure that a calculator is available for each student to use while taking this assessment. Students are allowed to use any model or type of calculator.

The use of calculators has made it possible for assessments to use realistic data, and solutions are designed to have decimal and fraction answers. Students must decide when and how to use values and apply appropriate operations. Prompts have more intense problems that can be solved by a greater variety of mathematical techniques. Given the more diverse and technical problems, it may be difficult for a student to complete the assessment in the allowed time without the use of a calculator.

Fourth Grade: Calculators will not be allowed on the DMA.

The fourth-grade assessment will be purposely designed so that calculators will not be necessary. Therefore, calculators will not be used on the fourth-grade assessment.

The use of a calculator is still appropriate in the fourth-grade classroom (i.e., number patterns, guess and check, real-life applications, and investigations).

About the Assessment

Of the five test items included in each assessment, most will begin with a problem situation followed by a series of related questions. All students are required to solve the first test item located on the front-page. This test item is designed to assess broad-based problem-solving strategies using basic computation skills.

On the remaining three pages of the assessment, students will select three of the four remaining test items. These test items cover a wide range of identified content strands. This allows students to choose test items that best demonstrate their mathematical abilities. A list of the content strands and the mathematical terms and vocabulary that may be included on the assessment can be found in Section II of the DMA Toolkit.

The test items are targeted for students performing at grade level. Some portions of a test item may be designed for students to demonstrate advanced thinking skills. Thus, there may be portions of some test items that all students will not complete. This will not necessarily prevent them from receiving a satisfactory score on the Direct Math Assessment.

Section II

Essential Knowledge, Processes, and Skills

- ✓ Mathematics Terms and Vocabulary
- ✓ Content and Skills
- ✓ Problem Solving Strategies
- ✓ Communication Skills

Mathematical Terms and Vocabulary (Midyear Eighth Grade)

A
acute angle
adjacent angles
angle
area
average

B
bar graph
base (exponential)
base (geometric)
billion
billionth

C
Celsius
centi-
centimeter
circle
circle graph
circumference
column
combination
commission
common denominator
common factor
common multiple
composite number
cone
congruent
consecutive
coordinate plane
cross product
cube
cubed
cylinder

D
data
day
decimal
degree
denominator
dependent
diagonal
diameter
difference
digit
distance
divisor

E
equally likely
equation
equilateral triangle
equivalent
estimation
evaluate
event
exponent
expression

F
factor
foot
formula
fraction
fraction bar
frequency

G
gallon
gram
graph
greatest common factor

H
hexagon
hour
hundred
hundredth
hypotenuse

I
improper fraction
inch
indefinitely
independent
inequality
infinite
integers
intersecting lines
inverse operations
isosceles triangle

K
kilo-

L
label
least common denominator
least common multiple
legs of a right triangle
length
line
line
line graph
line plot
line segment
line symmetry
liter
lowest terms

M
mean
median
meter
metric system
midpoint
mile
milli-
million
millionth
minute
mixed number
mode
multiple

N
network
numerator

O
obtuse angle
octagon
operation (numerical)
order of operations
ordered pair
origin
ounce
outcome

P
parallel lines
parallelogram
pattern
pentagon
percent
perimeter
perpendicular
pi (π)
pictograph
pint
place value
plane
polygon
population
pound
prime factorization
prime number
prism
probability
product
proportion

Q
quadrant
quadrilateral
quart
quotient

R
radius
random
range
rate
ratio
rational number
ray
reciprocal
rectangle
reflection
remainder
repeating decimal
right angle
right triangle
rotation
rounding
row

S
sample
scale drawing
scalene triangle
second
sequence
similar figures
simplify
solution
sphere
square
square unit
squared
statistics
straight angle
sum
symmetry

T
table
tenth
terminating decimal
thermometer
thousand
thousandth
ton
translation
trapezoid
triangle

U
unknown

V
variable
vertex
volume

W
whole number
width

Y
yard

Possible Targeted Content and Skills

With references to Achievement Standards

For midyear 8th grade assessment, prompts will be restricted as indicated in italics.

- **Basic Arithmetic, Estimation and Accurate Computations**
  1. Compute with decimals, integers, and fractions 581.01.a, 581.02.a
  2. Convert fractions, decimals, and percents 581.01.a
  3. Compare and order decimals, fractions, and integers 581.01.a,c,e
  4. Apply rates, ratios, proportions and percents 581.01.a, 581.02.a 583.03.a, 583.02.a
  5. Estimate with decimals and fractions 581.03.a
  6. Recognize and compute second- and third-degree exponents 581.02.b
  7. Evaluate mathematical expressions using the order of operations 581.02.a,b 584.02.b

- **Mathematical Reasoning and Problem Solving**
  1. Understand and use a variety of problem-solving skills 582.01.a,b
  2. Use reasoning skills to recognize problems and express them mathematically. 582.02.a,b
  3. Apply appropriate technology and models to find solutions to problems. 582.03.a
  4. Communicate results using appropriate terminology and methods 582.04.a

- **Concepts and Principals of Measurement**
  1. Use rates to make indirect measurements 583.02.a
  2. Understand and use proportions, ratios and scales 583.03.a
  3. Understand units and their relationship to one another and to real world applications 583.04.a

- **Concepts and Language of Algebra**
  1. Use variables and algebraic expressions 581.01.a,b
  2. Evaluate formulas 584.02.a-c, 584.03.a

- **Concepts and Principals of Geometry**
  1. Measure, compute and compare perimeters of polygons and circumferences of circles 583.01.a,b,c, 585.01.b,c 583.02.a, 583.04.a
  2. Compute and compare areas of rectangles, triangles and circles 585.01.c
  3. Identify and classify angles 583.01.c, 585.01.b
  4. Identify and classify polygons 585.01.b
  5. Apply geometric properties and relationships *(e.g. symmetry, congruency, and similarity)* 585.01.a, 585.02.a
  6. Recognize relationships of parallel and perpendicular lines 585.01.b
  7. Plot points on the coordinate plane 585.03.a
  8. Find and compare surface area volumes of rectangular prisms 583.01.b,c, 585.01.c

- **Data Analysis, Probability and Statistics**
  1. Make predictions based on data given or collected 586.05.a
  2. Find and interpret measures of central tendencies *(mean, median, mode)* and range of data 586.03.a,b
  3. Organize, display and analyze data *(graphs, charts, tables, diagrams, plots)* 586.02.a 586.01.a
  4. Understand concepts of chance *(listing and counting outcomes, calculate simple probabilities)* 586.04.a,b

- **Functions and Mathematical Models**
  1. Recognize, generate, and extend sequences and patterns 584.01.a, 587.01.a
  2. Analyze functional relationships *(i.e., how change in one quantity affects change in another)* 587.01.b 584.03.b, 584.01.b

Achievement Standards can be obtained on the internet at: http://www.sde.state.id.us/osbe/exstand.htm

Suggested Problem-Solving Strategies To Teach Your Class

(Eighth Grade)

When students encounter a math problem they can't immediately solve, have them try one or more of the following:

1. Use a graph, table, drawing, or pattern.
2. Make a list or a table.
3. Eliminate possibilities.
4. Guess and check/experiment.
5. Work backwards (inverse operations).
6. Use objects.
7. Use logic.
8. Use an equation/formula.
9. Solve a simpler problem.
10. Recognize and use appropriate technology.

Problem-solving strategies should be integrated throughout all of the content strands.

Communication is key!

Emphasize skills that enable students to communicate results using appropriate terminology and methods. 582.04.a

Section III

Scoring

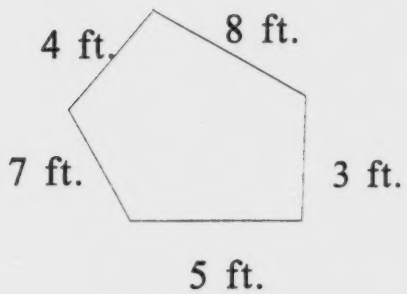
- ✓ Two Ways to Evaluate Student Learning
- ✓ Idaho Scoring Standard
- ✓ 2000 Assessment
- ✓ 2000 Main Rangefinders

Two Ways To Evaluate Student Learning

Here is how two methods of evaluation assess the same content strand. The first seeks the right answer. The second measures understanding concepts.

Standardized Test

What is the perimeter of the pentagon below:



a) 70 ft.
b) 27 ft
c) 3360
d) 5 ft
e) none of the above

In this example, the student may successfully answer the question without understanding any of the terms or underlying mathematics involved. Many students would be able to correctly guess the answer.

For those students who do know the terms and concept, basic addition is the only skill this problem assesses, as it is the only one required to answer the question.

Direct Assessment (Open-Ended)

Draw a pentagon with a perimeter of 73 feet and label the lengths of each side.

This prompt represents an open-ended problem. The student may answer the question in a variety of ways. The response will give greater insight about the student's understanding of perimeter and pentagon. The strategies and processes he\she uses will also reveal the sophistication of their thinking skills. This type of question does not ignore computation but integrates it into finding a solution.

Idaho Direct Mathematics Assessment Scoring Standard

⑤ Advanced

A score of *5* indicates that the student demonstrates advanced understanding of the problem/situation presented. The student recognizes the situation and is able to determine which processes will best solve it. A *5* paper demonstrates higher-order thinking skills and exhibits above grade-level processes for determining solutions. A score of *5* indicates that the student completes the processes appropriately, determines the solutions accurately, and communicates effectively.

⑤ *papers exhibit <u>most</u> of the following:*

* Advanced proficiency of basic skills
* Advanced understanding of situations
* Advanced mathematical vocabulary, use of symbols and communication skills
* Higher-order thinking skills (analysis, synthesis, and evaluation)
* Appropriate processes accurately completed
* Effective problem-solving strategies
* Minimal or non-existent errors
* Innovation and creativity

④ Proficient

A score of *4* indicates that the student demonstrates thorough understanding of the problem/situation presented. Responses demonstrate a high level of thinking, but not advanced for grade level. Demonstrated problem-solving strategies are correct, although there may be some computational or surface errors which do not interfere with correct processes. Structure of responses is clearly defined and adaptable. A *4* paper exhibits proficient mathematical achievement at grade level.

④ *papers exhibit <u>most</u> of the following:*

* Proficiency in basic skills
* Thorough understanding of situations
* Effective mathematical vocabulary, use of symbols and communication skills
* Adaptable processes
* Effective problem-solving strategies
* Few computational or surface errors
* Defendable solutions
* Clearly defined structure

③ Satisfactory

A score of *3* indicates that the student is performing at grade-level in mathematics. Student responses exhibits evidence of understanding the problem/situation presented, and he/she adequately communicates about them. Basic thinking skills and purposes are apparent. Problem-solving strategies and process development are evident. A *3* paper exhibits satisfactory achievement at grade level, in spite of occasional computational or surface errors.

③ *papers exhibit <u>most</u> of the following:*

* Basic understanding of grade-level skills
* Basic understanding of situations
* Satisfactory mathematical vocabulary, use of symbols and communication skills
* Appropriate use of problem-solving strategies
* Occasional computational or surface errors
* Adequate solutions and processes
* Recognizable structure

② Developing

A score of *2* indicates that the student is progressing toward grade level in mathematics. Although the student struggles to communicate effectively, responses do exhibit limited evidence of understanding. Although basic thinking skills and purposes are apparent, computational skills, problem-solving strategies, and process development are limited. Frequent surface errors and lack of structure detract from mathematical achievement at grade level.

② *papers exhibit <u>most</u> of the following:*

* Development toward proficiency of basic skills
* Limited understanding of situations
* Limited mathematical vocabulary, use of symbols and communication skills
* Limited use of problem-solving strategies
* Frequent computational or surface errors
* Limited process development
* Limited structure

① Minimal

A score of *1* indicates that the student demonstrates significant difficulty with basic mathematics concepts as well as with implementing problem-solving strategies. Although the student may attempt to solve most problems, computational skills, basic thinking skills, structure, and process development are severely lacking. Frequent errors and lack of communication skills are obvious. Development toward grade-level proficiency is not evident.

① *papers exhibit <u>most</u> of the following:*

* Minimal development of basic skills
* Minimal understanding of presented situations
* Inadequate mathematical vocabulary, use of symbols and communication skills
* Minimal use of basic thinking skills
* Lack of process development
* Minimal problem-solving strategies
* Numerous computational errors
* Inappropriate processes
* Significant lack of structure

⓪ Insufficient

A score of zero indicates that the paper shows insufficient evidence of minimal development toward proficiency or are blank or illegible.

2000 Idaho Eighth Grade Direct Mathematics

Welcome to the 2000 Direct Math Assessment. It is important that you explain and show how you solved the problems on this assessment. If you use a calculator, show how you set up the math.

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36-inch string of licorice? Show or explain how you found these amounts.

Achievement Standards References: 581.01.a 581.02.a,c 583.01.c 584.01.a 584.02.a

Read the remaining four numbered problems (2, 3, 4, and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ Suppose you are being timed on a five-mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

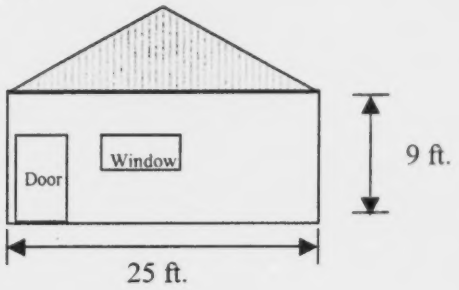
a. If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.

b. If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.

c. If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.

Achievement Standards References: 581.01.a 581.02.a 582.01.a 583.01.c 583.01.c 583.02.a 587.01.a 587.03.a

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

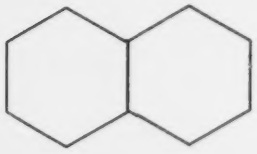
b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

c. The gable (shaded area) is an isosceles triangle with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

Achievement Standards References: 581.01.a,c 581.02.a 582.01.a,b 583.01.b,c 585.01.b,c,d

❹ The problem below uses all regular hexagons that have a measure of approximately1 cm on each side.

a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?



b. Draw the same figure used above and attach a third hexagon to **only one** of the full sides of your first figure. What is the perimeter of the resulting figure?

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing **only one** full side with the previous figure)? Show or explain how you found your answer.

---

❺ You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

a. In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

Achievement Standards References: 581.01.a 582.02.b 583.01.a,b,c 588.01.d

Direct Math Assessment

Eighth Grade
MAIN RANGEFINDER 5

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

Sally

$36 \cdot \frac{1}{2} = 18$ in.

or

$36 \div 2 = 18$ in.

Sally got ½ of the 36 inch string of licorice which is 18 inches

Bea

Sally = 18 in.
Pat = 12 in. → $\begin{array}{r} 18 \\ +12 \\ \hline 30 \end{array}$ $\begin{array}{r} 36 \\ -30 \\ \hline 6 \text{ inches} \end{array}$

Add up the amount Pat and Sally go and subtract it from the total amount and Bea got (6 inches.)

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

$\frac{6}{36} = \frac{1}{6}$

↓ amount she got / total amount → reduce the fraction

$1 \div 6 = .16\overline{6}$ which is about

16%

Appropriate processes accurately completed

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36 inch string of licorice? Show or explain how you found these amounts.

with tax it's $1.26

5% of 1.20 is .06

$\begin{array}{r} 1.20 \\ +.06 \\ \hline \$1.26 \end{array}$

Sally paid 63 cents which is ½ of $1.26.

Pat had ⅓ of the licorice which is 42 cents

Bea had ⅙ which is 21 cents

Advanced communication

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Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

a. If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.

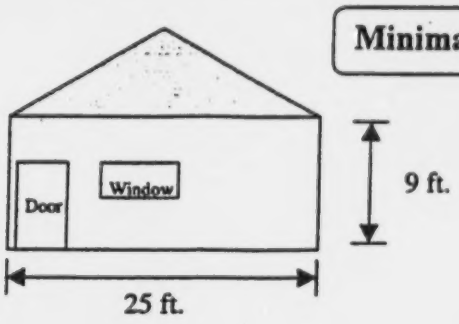
b. If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.

c. If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.

BEST COPY AVAILABLE

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.

Minimal or non-existent errors



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

Advanced understanding of situation

a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

wall space with window & door: $25 \times 9 = 225$

$225 - 41 = 184$

Door $= 6.5 \times 4 = 26$ sq ft

window $= 5 \times 3 = 15$ sq ft

$26 + 15 = 41$

entire wall area − window + door area = 184 square feet

Think skills (evaluation)

b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

$184 \div 175 = 1.05$ gallons

it is just a little bit over 1 gallon, so she would have to buy 2 gallons but she would only use a little bit of the second can of paint.

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

$3 \times 25 = 75 \rightarrow 75 \div 2 = 37.5$

The area of the gabel is 37.5 square feet.

❶ The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

a. **Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?**

10 cm because you only count the exterior wa
and not the 2 that meet in the middle, so you
subtract 2 from 12 and get 10cm

Higher thinking skills

b. **Draw the same figure used above and attach a third hexagon to only one of the full sides of your first figure. What is the perimeter of the resulting figure?**

14 cm

6 sides x 3 shapes = 18 → 18 − the 4 sides tha
touch = 14 cm

c. **What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing only one full side with the previous figure)? Show or explain how you found your answer.**

using the same equation as above...

6 x 10 = 60 → 60 − 18 = a perimeter of 42 cm

Innovative & creative

Above grade level processes

---

❺ You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value tha one-liter bottles.

Effective problem-solving strategies

two 1 liter bottles

mount 33.8oz x2 = 67.6

rice $1.20 x 2 = $2.40

with two 1 liter bottles
you get 67.6 oz for $2.40.

6-pack

amount 12 oz. x 6 = 72oz

price $2.49

you can get 72oz. for $2.49.

conclusion

72
−67.6
4.4

you can get 4.4 more oz
of soda for only 9 cents mor
if you buy the 6-pack.

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Direct Math Assessment

Eighth Grade
MAIN RANGEFINDER 4

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

$\frac{18}{1} \times \frac{1}{2}$ Sally got 18 inches of licorice

$\frac{+12}{30}$ inches taken

$\frac{36}{-30}$ inches

sally got 18 inches of licorice.
Bea got 6 inches of licorice.

Proficiency in basic skills

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

$\frac{6}{36} = \frac{1}{6} \times 100 = \frac{1}{6} = 11\frac{1}{6}$

17% of the licorice string.
$\frac{1}{6}$ of the licorice string.

Effective communication skills

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36 inch string of licorice? Show or explain how you found these amounts.

$1.20 × .05 = .06

$\frac{\$1.26}{1} \times \frac{1}{6} = 0.21\overline{6}$

$\frac{1.26}{1} \times \frac{1}{3}$

$\frac{1}{3} \times \frac{1.26}{1}$ .42

Bea $.21
Sally $1.63
Pat $.42

Thorough understanding

25
28

BEST COPY AVAILABLE

Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

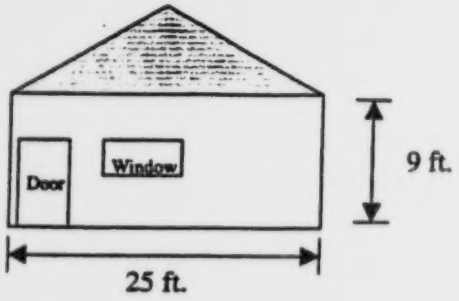
a. **If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.**

b. **If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.**

c. **If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.**

BEST COPY AVAILABLE

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft..

a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

25 × 9 = 225
6.5 × 4 = 26
5 × 3 = 15
15 + 26 = 41
225 − 41
184 ft to be painted

Thorough understanding

b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

184 − 175 = 9 feet unpainted

2 gallons of paint because with 1 gallon, 9 feet would be left unpainted

Defendable solution

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

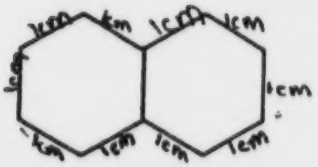
25 × 3 = 75
75 ÷ 2 = 37.5

Proficiency of basic skills

375 feet to be painted

4 The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

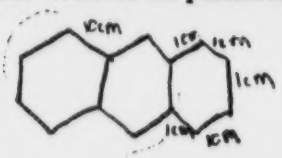
a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?



10
× 1cm
10cm

Defendable solution
Recognizable structure

b. Draw the same figure used above and attach a third hexagon to only one of the full sides of your first figure. What is the perimeter of the resulting figure?



10cm
+ 5cm
15cm

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing only one full side with the previous figure)? Show or explain how you found your answer.

10
×5
50cm

---

5 You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

72)2.49
≈$.03 an oz
rounded

33.8)1.20
≈$.04 an oz
(rounded)

720
- 67.6
4.4

.035
67.6)2.40
$.04 an oz

High level of thinking

you get 4.4 oz more for when you buy the 6-pack and to get 72 oz of pop from the liter, you would have to pay 18¢ more

Effective communication

Direct Math Assessment

Eighth Grade
MAIN RANGEFINDER 3

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

Sally = 18 inch
Pat = 12 inch
Bea = 6 inch.

36
× .5
18
-12
6

Basic understanding of grade level skills

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

$\frac{36}{6} = 6$ $\frac{1}{6}$ $.1\overline{6}$

$\frac{1}{6} = .1\overline{6}$

Process development is evident

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36 inch string of licorice? Show or explain how you found these amounts. $1.26

Sally pays .63¢
Pat pays .42¢
Bea pays .21¢

Lack of communication

Evidence of understanding

Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

a. **If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.**

You will job $3\frac{1}{2}$ miles and walk $1\frac{1}{2}$.

jog walk jog walk jog walk jog
1, $1\frac{1}{2}$, $2\frac{1}{2}$, 3, 4, $4\frac{1}{2}$, 5

Basic understanding of situations

b. **If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.**

He will fibish in 60 minutes $5 \times 12 = 60$.
You will finish in 109.5 minutes.

Lack of communication

Occasional errors

c. **If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.**

J W J W J W J W J W J W J
1, $1\frac{1}{2}$, $2\frac{1}{2}$, 3, 4, $4\frac{1}{2}$, $5\frac{1}{2}$, 6, $6\frac{1}{2}$, $7\frac{1}{2}$, 8, 9, $9\frac{1}{2}$, 10

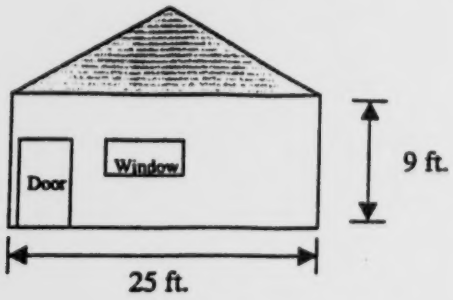
Jog = $6\frac{1}{2}$
Walk = $3\frac{1}{2}$

He finished in 120 minutes
You finished in 70.5 minutes

You won.

Recognizable structure

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

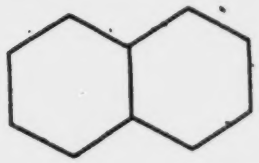
a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

4 The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?

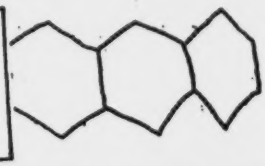


10cm

Basic understanding

b. Draw the same figure used above and attach a third hexagon to only one of the full sides of your first figure. What is the perimeter of the resulting figure?

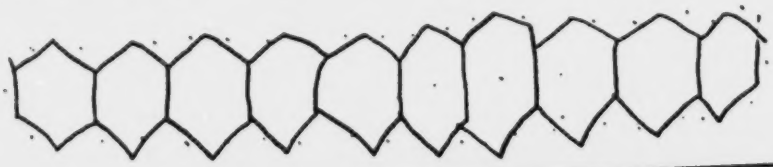
Thorough understanding of situation



14cm

Adequate solutions and processes

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing only one full side with the previous figure)? Show or explain how you found your answer.



42cm

Appropriate strategies

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5 You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

Well the six packs had a total of 72oz. for 2.49 and the two-liter had a total of 67.6oz for. 2.40 so you get more pop for about the same price.

Basic thinking skills

Satisfactory communication

35

Direct Math Assessment

Eighth Grade
MAIN RANGEFINDER 2

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

Sally gets 18 in.
Bea gets 6 in.
I divided 2 by 36 and then added 18 and 12

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

1/6, 16.6%
I lowered 6/36 and got 1/6 and divided 6 by 100 to get the percent

Basic understanding of grade level skills

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36 inch string of licorice? Show or explain how you found these amounts.

Limited mathematical language & communication skills

Limited process development

Sally-0.65
Bea-0.21
Pat-0.30
I found the fraction in each then divided each by the denominator then numerator then added 0.05 to each

Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

a. **If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.**

jog-m
walk-h
jog-m
walk-h
jog-m
jog m

you would only walk two times unless you walk the last mile or you would go 5½ miles

Development toward basic skills

b. **If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.**

he would

I multiplied 8x4 and then 11x2 and added the two answers then I multiplied 12x5 and his was lower

Lack of completed process

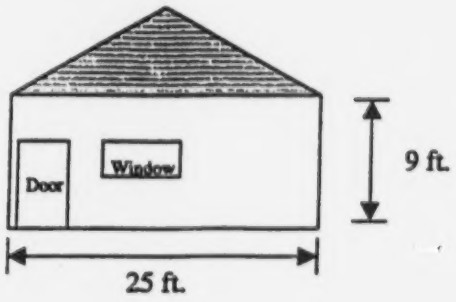
c. **If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.**

I would

I added the extra 5 miles then multiplied 7:8 and 11x3 added the answers then multiplied 12x10 and mine was lower

Struggles to communicate effectively

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

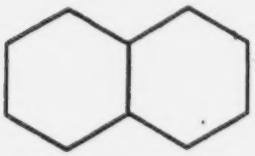
a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

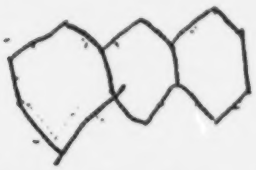
4 The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?



10cm I added each side

b. Draw the same figure used above and attach a third hexagon to **only one** of the full sides of your first figure. What is the perimeter of the resulting figure?



14cm I added each side

Limited use of problem solving strategies

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing **only one** full side with the previous figure)? Show or explain how you found your answer.

Basic understanding of Situations

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5 You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

I multiplied 33.8×2 and 12×6

and 33.8×2=67.6

Struggle to communicate

Direct Math Assessment

Eighth Grade
MAIN RANGEFINDER 1

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

Sally - ½ = 18 in half of 36
Bea - 30 in

18
+12
30

Minimal development basic skills

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

Inappropriate processes

Bea - 30 in because 18 + 12 = 30 and half of the licorice is 18 in. = ½. Pat get 12 in. so I

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does **each** person pay for **their** part of the 36 inch string of lico how you found these amounts.

Minimal understanding of presented situation

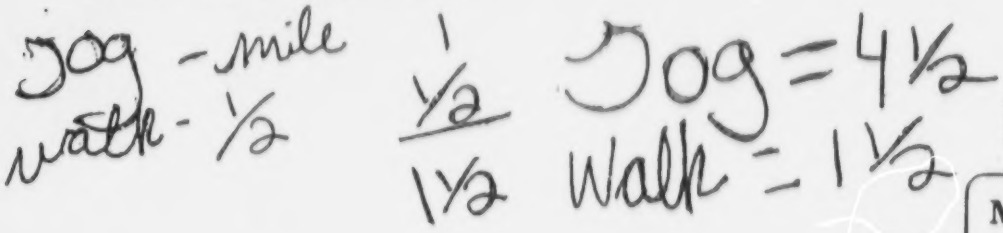
$1.20
36
1.56
+ 5

it would be $1.61 - plus tax

Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

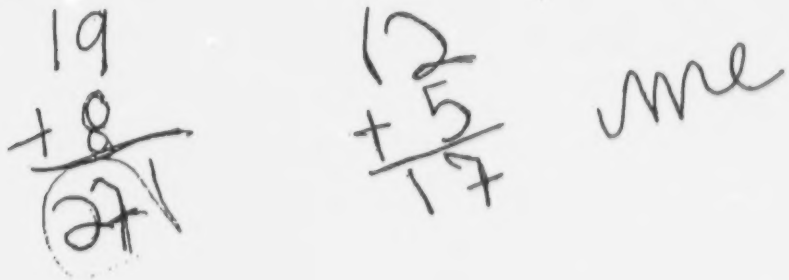
❷ Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.

a. **If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.**

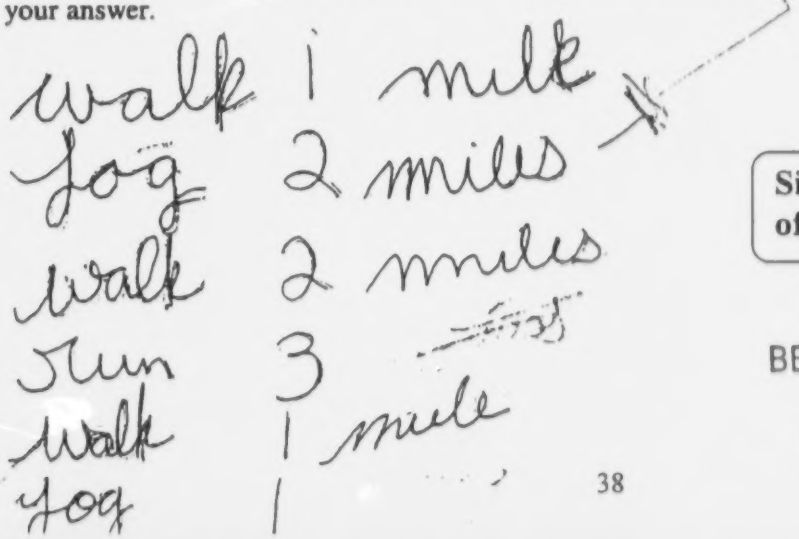


Minimal problem solving strategy

b. **If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.**



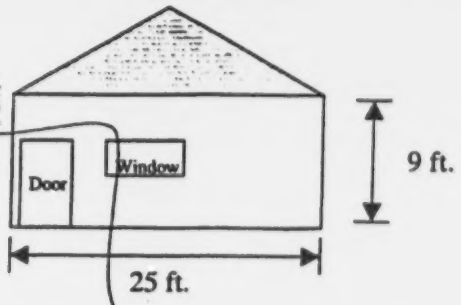
c. **If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.**



Significant lack of structure

BEST COPY AVAILABLE

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

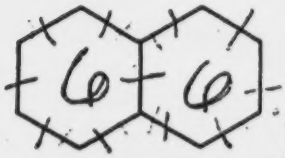
b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

BEST COPY AVAILABLE

❹ The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?



if they are sharing one si it would be 11 if they were sharing on side it would be

b. Draw the same figure used above and attach a third hexagon to only one of the full sides of your first figure. What is the perimeter of the resulting figure?

Lack of process development

it would be 18 but if it was sha it would be 17.

Minimal understanding of presented situation

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new full side with the previous figure)? Show or explain how you found your answe

it would be 30, but they are sharing so it would be 29.

---

❺ You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

It would coast more if you bot to bottles ($2.40). you would get more if you bot a six-pa would be better.

Inadequate mathematical language & communication

Direct Math Assessment

Eighth Grade

MAIN RANGEFINDER 0

❶ Sally, Pat, and Bea are sharing one 36 inch long piece of red licorice. Sally gets ½ of the licorice string, Pat gets 12 inches of the licorice string, and Bea gets the rest of the licorice string.

a. How many inches of the licorice string do Sally and Bea each get? Show or explain how you found your answers.

Insufficient evidence

b. What fraction of the total licorice string does Bea get? What percent of the licorice string is this? Show or explain how you found your answers.

c. The licorice string cost $1.20 without tax. There is a 5% sales tax added to the cost of the price of the licorice. How much does each person pay for their part of the 36 inch string of licorice? Show or explain how you found these amounts.

Read the remaining four numbered problems (2, 3, 4 and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you choose not to answer.

❷ **Suppose you are being timed on a five mile run. Your plan is to first jog one mile then walk a half-mile and then jog another mile then walk a half-mile and continue this pattern for the five miles of the run.**

a. If you stick to your plan, how many of the five miles will you jog and how many will you walk? Show or explain how you found your answer.

3 jog 4 walk

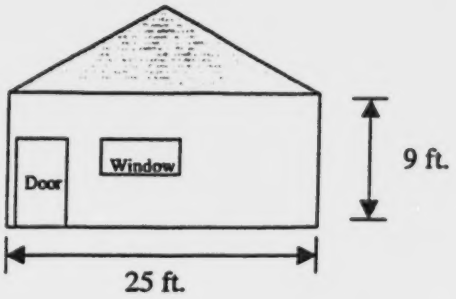
Insufficient evidence of basic skills

Minimal evidence of understanding

b. If you maintain a rate of 8 minutes per mile jogging and 19 minutes per mile walking while your friend Tom jogs the entire race and maintains a rate of 12 minutes per mile, who will finish first? Show or explain how you found your answer.

c. If the run were extended to 10 miles, who do you think would finish first? Show or explain how you found your answer.

❸ Mrs. Sanchez is planning to paint one of the rectangular walls in her classroom. A diagram of the wall is shown below.



Length:	25 ft.
Height:	9 ft.
Door:	6 ft. 6 in. by 4 ft.
Window:	5 ft. by 3 ft.

a. Find the total area to be painted. The gable (shaded triangle), window and doors are not to be painted. Show or explain how you found your answer.

b. If a gallon of paint covers 175 square feet, how many gallons of paint does Mrs. Sanchez need to buy? Show or explain how you found your answer.

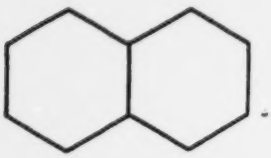
8 gallon

Insufficient evidence of skills

c. The gable (shaded area) is an isosceles triangles with a height of 3 feet. If Mrs. Sanchez decides to paint the gable as well as the rest of the wall, what is the additional area to be painted? Show or explain how you found your answer.

4 The problem below uses all regular hexagons that have a measure of approximately 1 cm on each side.

a. Two regular hexagons measuring approximately 1 cm on each side are drawn below. They share one full side. What is the perimeter of this drawing?



b. Draw the same figure used above and attach a third hexagon to **only one** of the full sides of your first figure. What is the perimeter of the resulting figure?

c. What is the perimeter of 10 regular hexagons placed in a similar way (each new hexagon sharing **only one** full side with the previous figure)? Show or explain how you found your answer.

Blank

---

5 You and a good friend Debbie were shopping in a grocery store for soda for a party at school. You noticed that you could buy the soda in a one-liter bottle (approximately 33.8 oz.) or six-packs of 12 oz. cans. The six-pack cost $2.49 and the one-liter bottle cost $1.20. Debbie suggested buying two of the one-liter bottles because it would be cheaper. Being very thrifty, you did a few calculations and said you should buy the six-pack because it would be the better buy. Debbie was impressed and asked how you figured that out.

In the space below explain or show how you knew that the six-pack was a better value than two of the one-liter bottles.

Section IV

Preparing for the DMA

- ✓ Strategies for Teachers
- ✓ Advice for Students
- ✓ Scoring Standard for Students
- ✓ Practice Prompts and Assessments

Strategies for Teachers

1. Learn more about the DMA.
   - Participate in state-sponsored inservice workshops and training.
   - Attend the DMA presentations at the Idaho Council of Teachers of Mathematics (ICTM) Fall Conference.
   - Request DMA inservice through the State Department of Education Math Coordinator contacting them by phone (208-332-6932).

2. Invite a scorer from a previous year to share insights and how these assessments have affected his/her math instruction.

3. Provide copies of scoring standards to students, other teachers, and parents.

4. Present a workshop for parents in which scoring standards and anchor papers are discussed, and questions are answered.

5. Provide students with opportunities to practice problem solving and responding to practice prompts and practice assessments including assessments from previous years. Allow students to score their own papers using the scoring standard.

6. Encourage all mathematics teachers to use scoring standards, or parts of it (when appropriate) to assess math assignments.

7. Ask students to explain the DMA to parents using their papers, the scoring standard, and anchor papers.

8. Score papers for the DMA and share your insights and conclusions with other faculty.

9. Hold a school-wide math assessment. Develop prompts, administer the assessment, and using the DMA scoring standard, find anchor papers, and score the papers. Invite parents, students, and community members to help score the papers.

10. Discuss higher level thinking skills with students. Encourage them to consider problem solving strategies and processes, and to explain these orally and in writing.

11. Ask students to make up their own prompts. Discuss these as a class and collect good samples for future practice.

12. Using copies of anchor papers, invite students to compare their work to anchor papers and explain similarities and differences. Ask them to use the anchor papers to set concrete goals for their own mathematics improvement.

13. Following the assessment, make copies of student responses for comparison with scores when the results arrive. These comparisons will improve teacher's instruction and understanding of the assessment.

14. Refer to the appropriate *Mathematics Terms and Vocabulary*, *Problem Solving Strategies*, and *Skills and Content Strands* documents to align instruction and curriculum with the assessment.

Advice for Students
Preparing for the Direct Mathematics Assessment

Appearance

DO write and organize your work so it is easy to read and follow.

DON'T be overly concerned with handwriting or spelling. They do not enter into scoring unless they hinder communication.

Communication

DO show your work and justify your answers. Use appropriate mathematical symbols and terms.

Example:
DO write 12 + 10 + 5 = 27

DON'T think that longer answers are always better.

Example:
DON'T write "First I took the twelve, then I added the ten, then I added the five and got twenty-seven."

Assessment Strategies

DO practice taking sample assessments. Complete as much of the first problem as you can. Then skim the remaining problems and choose the ones that best demonstrate your abilities.

Example:
DO attempt to answer all parts of the questions you select.

DON'T think you need to do every problem in the order it is written on the assessment.

Example:
DON'T spend too much time on any one problem. If you are having trouble, move on to another question.

Note to teacher: Holistic scoring takes into consideration all work shown on the assessment unless it is crossed out or erased. If students work on **all** prompts *after* the first page of the assessment and decide that one prompt does not demonstrate their best work, students may cross out all work done on that prompt.

Direct Mathematics Scoring Standard for Students

***5* Advanced**

A score of *5* shows that you have an advanced understanding of math skills needed to solve the problem. You showed advanced ability to explain and show what you know. You included clear and understandable steps in getting your answer. Problem solving strategies were used well in reaching your solution. There were few or no mistakes.

***4* Proficient**

A score of *4* shows that you have a clear understanding of math skills needed to solve the problem. Problem solving strategies are correct. Your answers were explained well, although you may have made a few mistakes.

***3* Satisfactory**

A score of *3* shows you have a basic understanding of math skills needed to solve the problem. Problem solving strategies were used. When you showed your work, some steps were unclear or missing. There were occasional mistakes.

***2* Developing**

A score of *2* shows that you are beginning to use basic math skills. You may have tried to use problem solving strategies, but they do not fit the situation. The steps are difficult to follow and there are many mistakes.

***1* Minimal**

A score of *1* shows that you have difficulty understanding the problem and using math skills to solve it. You did not choose a correct way to solve the problem. Your answers were incorrect or did not fit the problem.

***0* Insufficient**

A score of *0* shows you left the assessment blank, or your work could not be read or understood.

Idaho DMA Practice Assessment

1998

Welcome to the Idaho Direct Math Assessment. It is important that you explain and show how you solved the problems on this assessment. If you use a calculator, show how you set up the math.

❶ The following table gives the scoring of the Chicago Bulls in the final game of the 1998 NBA playoff game against the Utah Jazz.

Player	Number of Field goal (2 points each)	Number of Field goals (3 points each)	Number of Free Throws (1 point each)
Buechler	1	0	0
Jordan	15	3	12
Harper	2	0	0
Kukoc	7	1	0
Pippen	4	0	0
Rodman	3	0	1
Wennington	1	0	0

a. How many total points did the Bulls score in this game? Show or explain how you found your answer.

b. What percent of the total points did Jordan score? Show or explain how you found this percent.

c. What fraction of the total points did the five lowest scoring players make? Show or explain how you found this fraction.

d. If Jordan donates $23.23 to charity for each point he scored, how much would he donate for this game? Show or explain how you found this amount.

Read the remaining four numbered problems (2, 3, 4, and 5), and select three you wish to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you do not choose to answer.

❷

a. In the space below, draw a rectangle that has a perimeter 14 cm. Indicate the length of each side, but you do not need to draw the rectangle to scale.

b. In the space below, draw a second rectangle. Make the length of one side of this rectangle twice as long as the shorter side of the rectangle you drew in part (a), but keep the perimeter 14 cm. Indicate the length of each side of the rectangle.

c. What would be the length and width of a rectangle that has a perimeter of 14 cm and has the largest possible area? Explain how you know.

❸ There are six people in a room where a checkers tournament is being held. Each person in the room will play checkers with each of the other people exactly once.

a. How many different games will be played? Show or explain how you found your answer.

b. Four more people enter the checkers tournament, how many games would now have to be played so that each person would play all the other players exactly once? Show or explain how you found your answer.

c. How many games would be played if 37 people signed up for the tournament? Show or explain how you found your answer.

❹ For Christmas, you saved a total of $75.50 to buy gifts. You have to buy gifts for 2 brothers and your parents. You are planning to buy your parents a clock radio that is for both of them. The clock radio costs $33.50.

a. How much will you have left after buying the clock radio to spend on each brother? Show or explain how you found this amount.

b. What percent of your money do you spend on your parents? Show or explain how you found this percent?

c. If you find a shirt for one brother that costs $19.95 and a shirt for the other that costs $20.25, would you have enough money to buy all three gifts? Remember to add 5% sales tax to all purchases. Show or explain how you found your answer.

❺ Suppose that there are 8 green, 5 red, and 3 blue, and 2 orange M&M's in a bowl.

a. If you reach in and grab one M&M without looking, what color is it most likely to be? Explain how you found your answer.

b. What is the probability that you grab a blue M&M? Show or explain how you found your answer.

c. Suppose that you grab two M&M's and you do not see either of them. How many different combinations could you have? Show or explain how you found your answer.

Idaho DMA Practice Assessment

1998

Welcome to the 1999 Idaho Direct Math Assessment. It is important that you explain and show how you solved the problems on this assessment. If you use a calculator, show how you set up the math.

❶ In the last student council election, John and Mary both ran for student body president. They each spent money on poster paper, markers, and campaign buttons.

a. Complete the table below to find out how much money John and Mary spent on each of the items they used in their campaigns. (The prices below include sales tax.)

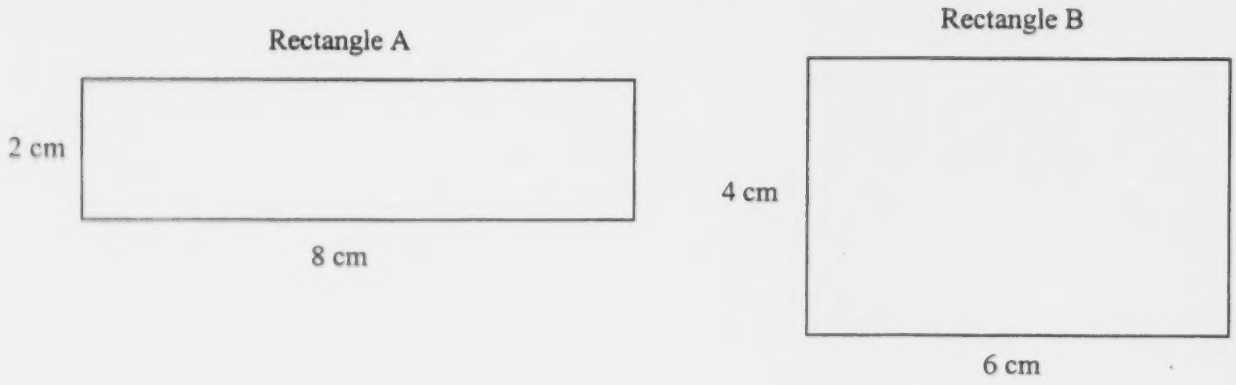
Item	Price each	Number John bought	Amount John spent	Number Mary bought	Amount Mary spent
Poster Paper	$1.25	27		43	
Markers	$1.19	12		17	
Buttons	$1.35	75		63	
		Total	_____	Total	_____

b. John and Mary were each given $200.00 to spend on the campaign. What percent of each student's $200.00 budget was used to pay for election supplies? Show or explain how you found your answers.

c. During the election, 3,200 ballots were cast. Mary received 3/5 of the votes and John received all of the remaining votes. How many more votes were cast for Mary than were cast for John? Show or explain how you found this amount.

Read the remaining four numbered problems (2, 3, 4, and 5), and select three to answer. Answer ALL of the parts of the three problems you choose to answer. Cross out the problem you do not choose to answer.

❷ Examine the two rectangles below.



a. Which rectangle has the largest area? Show or explain how you found this area.

b. Which rectangle has the longer perimeter? Show or explain how you found your answer.

c. Draw and label two rectangles each of which has a perimeter of 16 cm, but have different areas. (The rectangles do not need to be drawn to scale.) Show or explain how you found the area of each rectangle.

❸ The data below shows the test scores of the third-hour math class. In this class, 90-100% is an A; 80-89% is a B; 70-79% is a C; 60-69% is a D; and below 60% is an F.

99, 54, 82, 94, 77, 71, 56, 79, 72, 54, 90, 63,
68, 94, 82, 95, 62, 93, 91, 56, 88, 76, 76, 88, 88

a. Select a type of graph or chart to represent the data (bar graph, tally, circle graph, line plot, etc.). Draw and label the graph.

b. According to your graph or chart, did the class do well on this test? Explain your answer.

---

❹ Jenny's art class is going to make stickers for each of the digits 0 through 9. The stickers will be used individually or combined to make room numbers for the rooms in the school. Suppose the art class makes enough stickers for rooms 1 through 50.

a. Fill in the table to indicate the number of each type of sticker the art class will make.

Sticker	1	2	3	4	5	6	7	8	9	0	Total
Number needed											

b. Show or explain how you found your answers.

❺ To make one batch of chocolate chip cookies, you need the following items:

⅔ cups of shortening	3 ¼ cups of flour
¾ cups of white sugar	2 eggs
2 ½ cups of brown sugar	3 teaspoons of vanilla
¼ teaspoon of baking powder	1⅔ cups of chocolate chips

You have ¼ cup, 1/3 cup, and ½ cup measuring devices, but you do not have a 1-cup measuring device.

a. How many 1/3 cup measurements of chocolate chips do you need to make a batch of cookies? Show or explain how you found your answer.

b. Explain how you would use the ¼ cup, 1/3 cup, or ½ cup measuring devices to measure the flour, the brown sugar, and the white sugar needed to make the cookies.

c. You plan to make three batches of cookies for the party next week. What is the total amount of shortening that you will need? Show or explain how you found your answer.

Eighth Grade Idaho Direct Mathematics Assessment

#8-001 Eighth-Grade Practice Prompt Computations and Relationships

Idaho Power charges customers 4.596 cents per kilowatt-hour of electricity consumed each month. In addition to the cost of the electricity, Idaho Power charges each customer $2.50 per month.

a. If a customer consumed 1851 kilowatt hours during a month, find the total billing amount for that month? Show or explain how you found your answer.

b. If the total billing amount was $29.58, how many kilowatt-hours were consumed that month? Show or explain how you found your answer.

c. A certain refrigerator is labeled with an *Energy Guide* for consumers which reads: *ENERGY CONSUMPTION: 850 kWh per year*. How much will it cost per month on the average to operate this appliance at the rate given above? Show or explain how you found your answer. *(kWh is an abbreviation for kilowatt hours.)*

d. If Idaho Power decreased the rate per kilowatt hour by 10% and increased the customer charge by 50 cents, what would be the new total billing for the 1851 kilowatt hours which were consumed in part a of this problem? Show or explain how you found your answer.

Eighth Grade Idaho Direct Mathematics Assessment

#8-002 Eighth-Grade Practice Prompt Computations and Relationships

On October 20, 1997, Burt traveled from Idaho into Canada. Since he was going to shop and needed to buy gasoline, he exchanged United States dollars (US$) for Canadian dollars (C$). Canada uses a monetary system like the United States with dollars and cents. However, Canadian money is not worth the same as United States money. The exchange rate was C$1.3326 for each US$1.

a. Burt exchanged US$800.00 for C$. How many Canadian dollars did he receive? Show or explain how you found your answer.

b. Burt filled up his car at a Canadian gas station. The price for regular no-lead gasoline was 53.2 per liter. At the same time in the United States, regular no-lead gas was selling for $1.339 per gallon. Burt did not know the exact conversion between US gallons and the liter, but he knew that a liter is a little bit more than a quart. Compare the cost of gasoline in the U.S. and in Canada.

c. While shopping, Burt bought a diamond ring for his wife. It cost C$599.99. How many US$ would this be? Show or explain how you found your answer.

d. When Burt returned to the United States, he was required to pay 20% duty tax on Canadian purchases over US$400.00. The total of Burt's purchases was C$768.20. How much duty tax was Burt required to pay to the United States? Show or explain how you found your answer.

Eighth Grade Idaho Direct Mathematics Assessment

#8-003 Eighth-Grade Practice Prompt Computations and Relationships

Bricklayers use the formula N = 7LH to determine how many bricks they will need to build a wall. N = the total number of bricks needed, L = length of the wall, and H = the height of the wall.

a. How many bricks will be needed to build a wall 8 feet high and 35 feet long? Show or explain how you found your answer.

b. A bricklayer has 1820 bricks. He needs to build a wall 30 feet long. How tall can the wall be? Show or explain how you found your answer.

c. A brick weighs 1.75 pounds. If a wall is 5 feet high and 12 feet long. How much would the bricks needed to build it weigh? Show or explain how you found your answer.

d. A bricklayer needs to build a wall 4 feet high and 25 feet long. He has $1680 to buy bricks. How much can he spend on each brick? Show or explain how you found your answer.

Eighth Grade Idaho Direct Mathematics Assessment

#8-004 Eighth-Grade Practice *Computations and Relationships*

Roy is having a party and plans to invite seven friends. He wants to serve hamburgers, chips and pop to drink. He has $20 to spend and wonders if he can buy all the supplies for the party.

a. Hamburger costs $1.89 a pound and he can make 4 hamburgers from each pound of meat. Buns are $.75 for a package of 8. How many pounds of hamburger should he buy for 8 people to enjoy two hamburgers each? How many packages of buns will he need? How much will the hamburger and buns cost Roy? Explain.

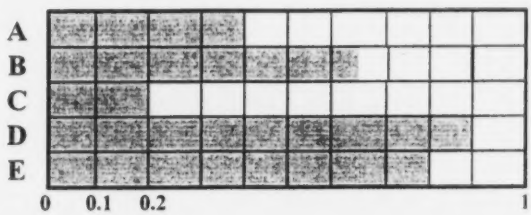
b. Roy also wants to buy two bags of chips at $1.99 each and a can of pop for everyone at $.65 each. How much will the chips and pop cost? Explain.

c. Roy does his shopping and gives the clerk his $20 bill. How much change will she give him back after she figures up his total cost? (Remember to add 5% sales tax)

Eighth Grade Idaho Direct Mathematics Assessment

#8-005 Eighth-Grade Practice Prompt *Computations and Relationships*

The following bar graph represents decimal values in tenths between 0 and 1 on a number line.



a. Arrange the names of the bars in order from their least to greatest value.

b. Which bar represents the decimal that is half way between 0 and 0.8?

c. What is the value of bar "B"?

d. What is the difference between the value of bar "D" and the value of bar "A"?

e. What is twice the value of the sum of bar "B" and bar "D"? Explain.

Eighth Grade Idaho Direct Mathematics Assessment

#8-006 Eighth-Grade Practice Prompt *Computations and Relationships*

The temperature in Yellowstone National Park for January 4th at 9:00 AM was -30°F.

a. If the temperature rose 12° from 9:00 AM to 12:00 noon, what was the temperature at noon?

b. From 12:00 noon to 3:00 PM, the temperature rose 2° every 20 minutes. What was the temperature at 3:00PM?

c. The temperature dropped 14° from 3:00 PM to 6:00 PM. What was the temperature at 6:00PM?

d. What was the average temperature for the day?

Eighth Grade Idaho Direct Mathematics Assessment

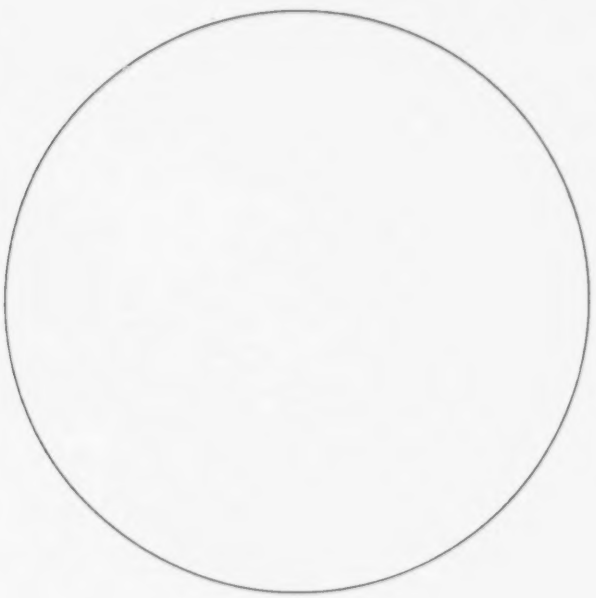
#8-007 Eighth-Grade Practice Prompt *Computations and Relationships*

Everyone in Class A was asked to choose their favorite sandwich from the following choices: peanut butter and jelly, tuna fish, and meat with cheese. The results of the survey were 17 for meat with cheese, 9 for peanut butter and jelly, and 8 for tuna fish.

a. What is the total number of students in Class A?

b. Figure out the percent of students that chose each type of sandwich.

c. Using your percents and the circle given, make a pie graph to show the results of the survey. Estimate the size of each piece.



Eighth Grade Idaho Direct Mathematics Assessment

#8-008 Eighth-Grade Practice Prompt *Computations and Relationships*

Kelcey has scores of 75, 95, 85, 96, 97, 92, 93, 81, 86, and 90 on her math tests this semester.

a. Calculate Kelcey's average test score. If an average of 90 is required for an A, would Kelcey receive an A for the semester? Show or explain how you found your answer.

b. If two more 100-point tests are given, what is Kelsey's highest possible average? Show or explain how you found your answer.

c. Using only the original test scores, Kelcey's teacher decides to throw out the lowest score and the highest score. What would Kelcey's average be now? Show or explain how you found your answer.

Eighth Grade Idaho Direct Mathematics Assessment

#8-009 Eighth-Grade Practice Prompt *Patterns and Functions*

Bill created the following secret code:

A=1	G=7	M=13	S=19	Y=25
B=2	H=8	N=14	T=20	Z=26
C=3	I=9	O=15	U=21	space=27
D=4	J=10	P=16	V=22	period=28
E=5	K=11	Q=17	W=23	question mark=29
F=6	L=12	R=18	X=24	comma=30

a. Using the code: What does the following message say?
19, 21, 5, 30, 27, 4, 9, 4, 27, 23, 5, 27, 23,
9, 14, 27, 25, 5, 20, 5, 18, 4, 1, 25, 29

b. After several others figured out Bill's secret code, he added five to each number.
i.e. A = (1+5) = 6
B = (2+5) = 7
C = (3+5) = 8

Put the following message in the new code.
GOOD LUCK

c. Besides adding 5 to each number, what else could Bill do to make his code more secretive?

Eighth Grade Idaho Direct Mathematics Assessment

#8-010 Eighth-Grade Practice Prompt *Patterns and Functions*

Susan gets a job at a local fast food restaurant. For the first 10 hours that she works, she is considered to be "in training" and will only make $4.50 an hour.

a. Complete the table showing what Susan will make after working the number of hours listed.

hours	0	1	2	3		8	9	10
wages	$ 0	$ 4.50	9.00					

b. After the 10 hours of training, Susan gets paid $5.15 an hour. Including the training, how much will Susan get paid for working her first 30 hours?

c. Susan puts 20% of her paycheck into savings. She also has to pay $40.00 for her uniform. If Susan's first paycheck is for 30 hours, how much money will she have left to spend?

Eighth Grade Idaho Direct Mathematics Assessment

#8-011 Eighth-Grade Practice Prompt *Patterns and Functions*

The technology class is making new locker number plates for the lockers in the eighth grade hall. Each digit comes on a separate plate. The lockers are numbered consecutively. The class needs to know how many of each digit plate to make.

a. How many of each digit are needed to number lockers from 1 to 30?

b. How many of each digit are needed to number lockers from 1 to 100?

c. How many of each digit plate would be needed to number lockers from 125 - 216?

Mary is having a birthday party. Her mother brings in a bowl with 16 pieces of candy, and passes them out to all the children. Each child takes a piece, in turn, until the bowl is empty.

a. If Mary took the first piece, and the next to the last piece, how many children were at the party?

b. Draw a diagram of the children and explain how you determined your answer.

c. Suppose any of the children could have had more than one piece of candy, and Mary still got the first and the next to the last piece. Is there any other possible number of guests at the party? If so, what are they?

Eighth Grade Idaho Direct Mathematics Assessment
#8-013 Eighth-Grade Practice Prompt *Patterns and Functions*

Sara noticed, when she stacked her quarters in piles of 5, she had 3 left over. When she stacked them in piles of 7, she had 5 left over.

a. If Sara has less than $10 worth of quarters, how many quarters does she have?

b. If Sara wanted to buy a new computer game that costs $20, how many more quarters would Sara need? (Remember to include Idaho's 5% sales tax.)

c. Sara will save 2 quarters each day, to add to what she already has, starting on a Wednesday. On what day of the week will Sara have saved enough money to buy the computer game?

0	1	2	3	4	5	6
1	2	4	7	11	16	
2	4	8	15	26		
3	7	15	30	56		
4	11	26	56	112		
5						
6						

a. Complete the table of numbers by filling in the boxes with the missing numbers of the pattern.

b. Explain how each new row of the table is generated.

								Number of Numbers	Sum of Numbers
Row 1				1					
Row 2			3		5				
Row 3		7		☐		11			
Row 4	13		15		17		☐		
Row 5	☐		23		☐		27	29	

a. Complete the triangular table of numbers by filling in the boxes with the missing numbers of the pattern.

b. Find the number of numbers in each row, and the sum of those numbers.

c. If the triangular pattern were continued through the tenth row, how many numbers would be in the <u>entire</u> table?

d. Describe the relationship, if there is one, between the row number and the sum of the numbers in that row. If the triangular table were continued through the twelfth row, find the sum of the numbers in the 12^{th} row of the table.

Jill has a piece of paper that measures 8 1/2 by 11 inches. She has cut it into strips that are 1 inch wide, placed them end to end on a table, and taped them together.

a. Draw a diagram that shows her new strip, and label the length and width.

b. How long is her new strip?

c. What is the perimeter of her new strip?

d. What is the area of the new strip?

e. If the strip had been 2 3/4 inches wide, how long would her new strip have been?

f. What would be the perimeter of this strip have been?

The target shown above is made of 4 circles with radii of 3, 4, 5, and 6 inches.

a. What is the area of the white center circle (radius 3 inches)? Use 3.14 for Pi.

b. What is the total area of the target's surface? Use 3.14 for Pi.

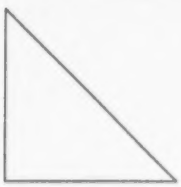
c. If a dart is thrown and randomly hits the target, what is the probability that the white center will be hit? Explain how you found your answer.

A rectangular field is 20 meters wide and 30 meters long.

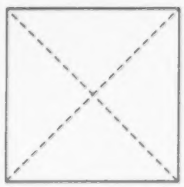
a. Find the perimeter and the area of the field.

b. Add the same number of meters to both the width and the length so that the area of the field is doubled. What is the perimeter of this larger field?

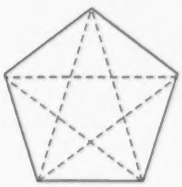
c. If the length and the width of the original field is doubled, what would the resulting field's area and perimeter be?



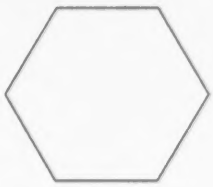
3 Sides
(0 diagonals)



4 Sides
(2 diagonals)



5 Sides
(5 diagonals)

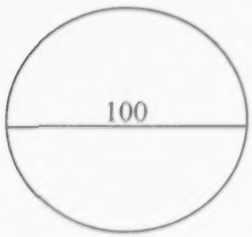


6 Sides
(___ diagonals)

a. In the space provided, draw in the diagonals for the six-sided polygon.

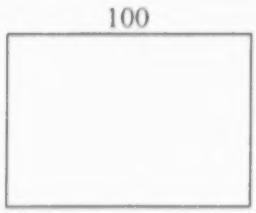
b. How many diagonals are there in an 8-sided polygon? Show or explain how you found your answer.

c. Explain how you would determine the number of diagonals in a 15-sided polygon.



$A = \pi r^2$

$C = \pi d$



78.5

$A = LW$

$P = 2(L+W)$

a. What is the area of the circle? (Use 3.14 for π)

b. What is the circumference of the circle? (Use 3.14 for π)

c. What is the area of the rectangle?

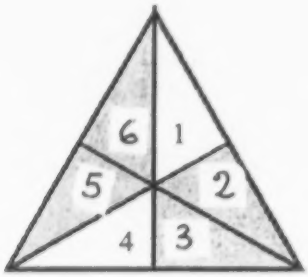
d. What is the perimeter of the rectangle?

e. Complete the table.

SHAPE	AREA	PERIMETER/CIRCUMFERENCE
Circle		
Rectangle		

f. Compare the areas and perimeters of the two shapes. Based on this information, what can you infer is the relationship between circles and rectangles?

The spinner below is an equilateral triangle, with the divisions made at the midpoints of the sides.



a. Why is the probability of spinning a one the same as the probability of spinning a six?

b. What is the probability of spinning an even number?

c. What is the probability of spinning a black?

d. What is the probability of spinning **both** a black and an even number?

Annette has earned the following scores on her tests: 83, 86, 92, 86 and 96.

a. Find the mean, median and mode of her scores.

b. Which answer (mean, median, mode) is the best representation of her final grade?

c. If Annette takes another test, what is the highest possible average she could receive on all six tests?

d. What score on the next test would Annette have to receive in order to have an average of 90% or higher on her tests?

QUESTIONS, COMMENTS OR CONCERNS

The State Department of Education would like to hear from you regarding the Direct Mathematics Assessment. If you have any questions, comments or concerns please list them in the space below. To mail: simply tear out this sheet, fold, seal, and place in your mailbox. No postage necessary.

Have a prompt for us to try! Submit your original prompt of no more than four parts, including references to the Achievement Standards. Or if you have a prompt that you have field-tested in your classroom, submit it along with a field-test results summary and we will consider it. Please include your contact information.

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